# StatXS

Mobile EEG Software

# Software User Manual

Advanced Brain Monitoring

# Table of Contents

# Chapter 1: Introduction

## A. STAT Overview

STAT acquires and stores physiological signals, in addition to other functionalities such as 1) Computing electrode impedances, 2) Transmitting data to a remote computer, 3) Administering tasks while collecting EEG data. In order to access STAT, the user must first login to Gateway desktop portal, allowing EEG acquisition data to be accurately and securely uploaded to the Gateway ABM database.

## B. Minimum System Requirements

- Personal computer (PC) with minimum Pentium™ 2.4 GHz processor
- Minimum of 2 GB of installed RAM memory and 4 MB virtual memory
- Windows 7, Windows 8, or Windows 10 operating system
- .NET framework version 3.5 installed
- Minimum of 50 MB hard disk space per 5-hour session
- VGA or higher resolution video adapter
- Two available USB ports (three for validation)

## C. Software License Agreement

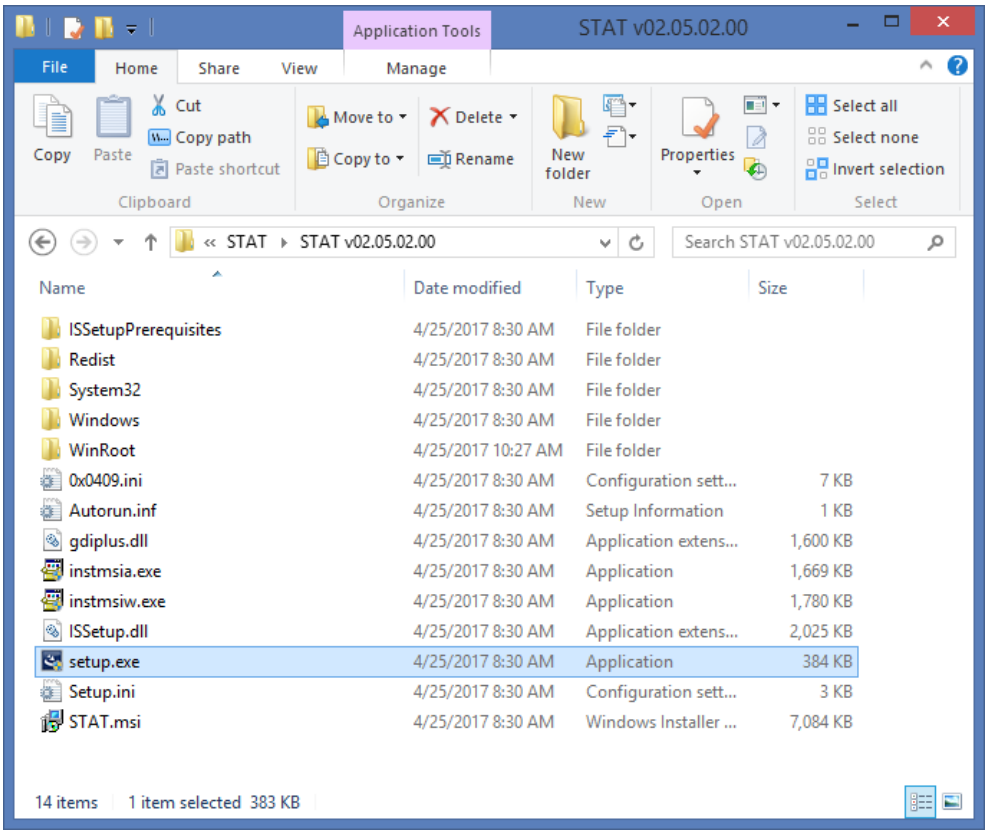
The purchase of a Stat EEG system entitles the Purchaser to a nonexclusive, single-use software license ("Software") from Advanced Brain Monitoring, Inc. subject to the following conditions:

The Purchaser may install the Software on only one computer, make one copy in machine readable form solely for backup purposes, provided that you reproduce all proprietary notices on the copy; and physically transfer the Software from one computer to another provided that the Software is used only on one computer at a time. The Purchaser may not copy, distribute, rent, lease, sub-license, transfer or use the Software except as allowed herein. The Purchaser may not alter, modify, decompile, translate, disassemble the Program; or use it to create a derivative work. Purchaser's right to use this Software automatically terminates upon failure to comply with any provision of this License or upon your destruction of all copies of the Program and documentation. Purchasers in good standing will be offered future improvements or upgrades to the Software. If Purchaser purchases an upgrade version of the software, it constitutes a single product with the Software that the purchaser upgraded. This License is deemed made, accepted and delivered in the State of California and shall be construed, interpreted and governing by the laws of the State of California, without regard or effect given to its or any other jurisdiction's conflicts of law jurisprudence.

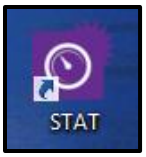
## D. Software Package Installation

1. Ensure no previous ABM acquisition software already exists in your installed programs directory. Installation will warn user if previous software has been detected. If so, uninstall ABM software and delete the folder found here: C:\ABM.

2. Double click on the *setup.exe* file. The *STAT – InstallShield Wizard* will appear. Follow the on-screen instructions to install the software package.



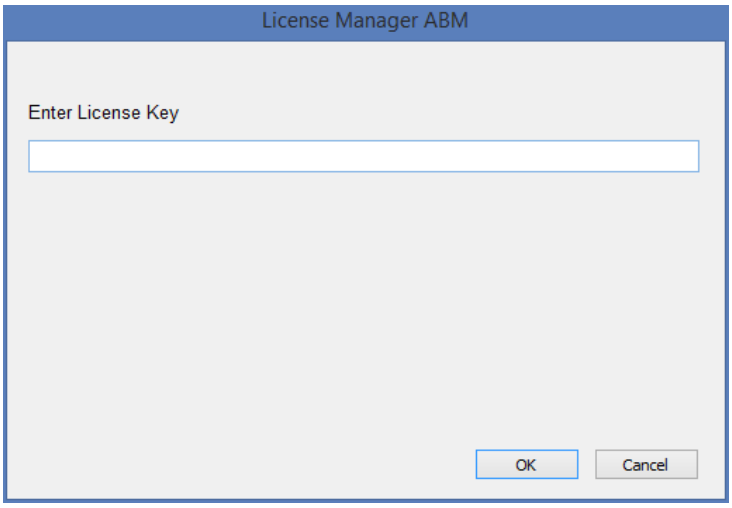

3. The STAT software shortcut will be placed on your desktop.




4. ABM recommends retaining the default installation folder, C:\ABM\STAT

## E. Software License Manager

Once STAT is installed, the first time a user opens the software, a pop-up window will appear:




A valid license Key will be provided with your purchase of the software, and should be included in your installation package. If it has not yet been obtained, please e-mail us at *support@b-alert.com* with your name and affiliation, and a license key will be given.

# Chapter 2: Gateway Portal

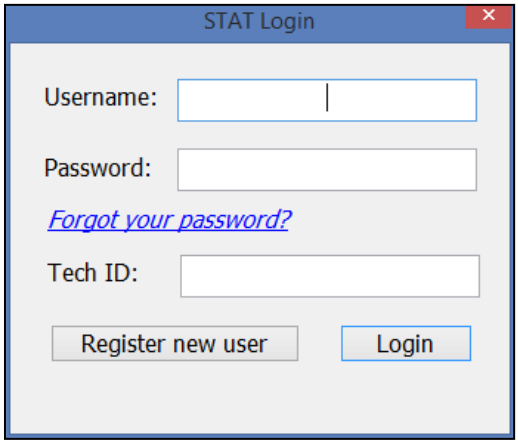
## A. Gateway Overview

Gateway is an end-to-end portal that allows EEG acquisition data to be accurately and securely uploaded to the Gateway ABM database. The desktop application in conjunction with STAT provides the security and traceability to acquire and upload unadulterated EEG data.

## B. Gateway Application

1. **Registration**

   The registration dialog box below will appear by pressing the "Register new user" link in the center of the STAT login window. Please fill in all fields with press "OK". ABM will e-mail you with your login credentials.




2. **LOGON/LOGOFF**

   Upon first opening the STAT software, "LOGIN" button allows user to login after all fields have been filled out. Once logged in, exiting the STAT software GUI allows the user to log-off.

   Note: In order to login to Gateway, you will need a unique TechID supplied by ABM in addition to your username and password.

3. **Pending Log Files**

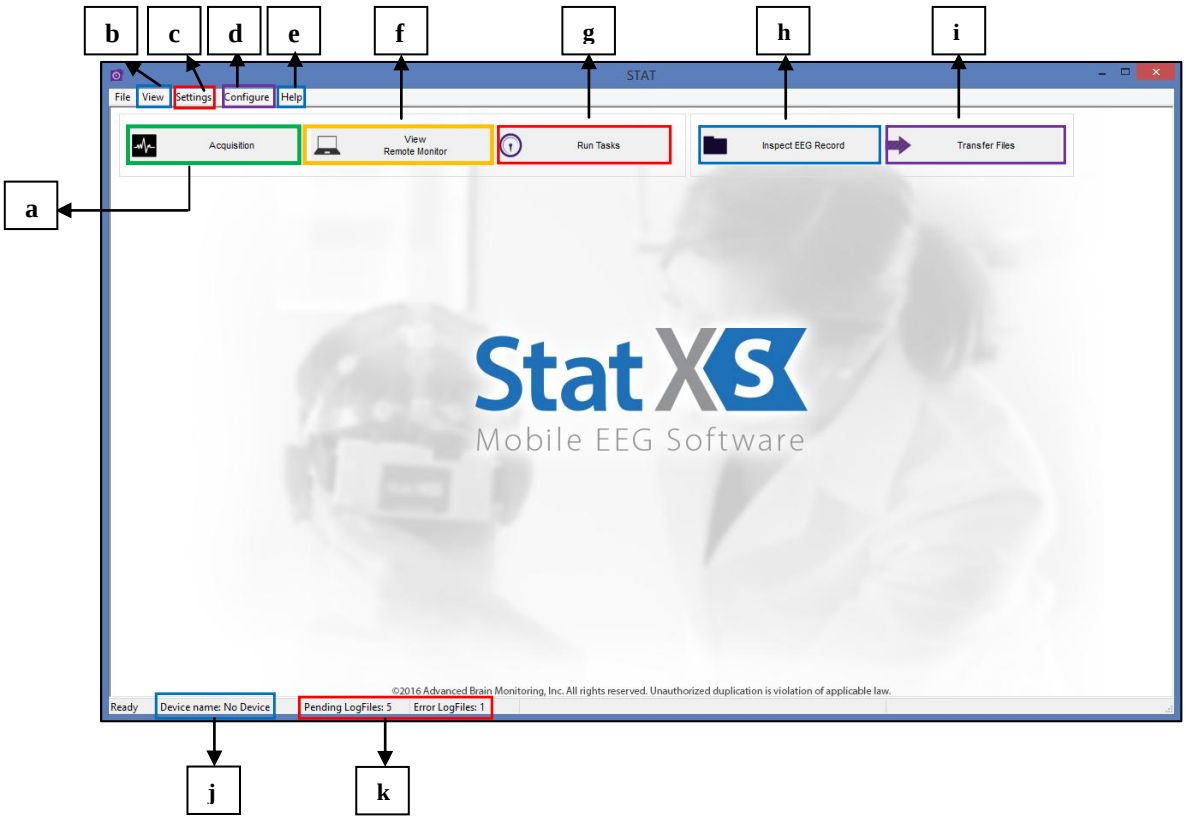
   At the bottom of the STAT GUI screen, the status bar will include if pending log files exist. After every completed acquisition, this value will increment by 1. If a user attempts to exit the STAT software without transferring files, an error message will appear.

4. **Error Log Files**

   If data is missing or corrupt, Gateway will ask user to quarantine the Error Log File. If user decides to quarantine, the log file will be categorized as an error and uploaded to ABM server with an error flag.

# Chapter 3: STAT Graphical User Interface (GUI)

## A. STAT GUI Overview (fNEI Pro mode)




The main GUI above contains the following interfaces:

a. **Acquisition function:** Allows users to start/stop data acquisition with their selected mobile EEG device. The communication port is automatically detected, and the Headset Configuration is automatically informed.
b. **View menu:** Allows user to show or hide status bar at bottom of screen
c. **Settings menu**: Allows remote monitoring of signal, signal assessment, and periodic impedance checks
d. **Configure menu**: Includes functionality of synchronizing devices, uploading firmware to headset or ESU, and configuring ESU
e. **Help menu**: Includes version number of software, Software License, and Device Information
f. **View Remote Monitor:** Intended for use on a monitoring unit (secondary computer) when the primary acquisition computer is set to retransmit using the Acquire & Retransmit function. This function does NOT store any data on the secondary computer viewing data.

g. **Run Tasks function:** Runs specified tasks while collecting EEG data
h. **Inspect EEG Record:** View raw signals in offline mode
i. **Transfer Files:** Transfer files onto the Gateway Portal
j. **Device Information:** Displays device name and serial number when device is connected
k. **Pending/Error LogFiles:** Displays number of files to be uploaded. Files are quarantined into Error LogFiles if there is an upload failure (other than connectivity). When files have been uploaded successfully, both tags will be 0.

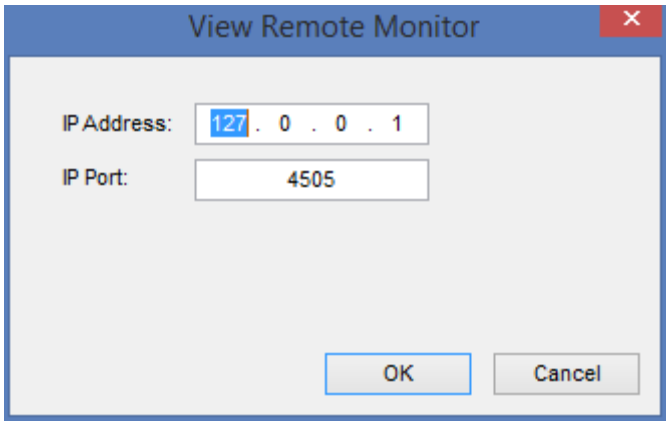
## B. Acquisition

Before starting an Acquisition, plug the B-Alert USB Receiver into the PC and switch ON the headset. Wait for the solid green LED pattern on the B-Alert headset (and, if you are using an ESU, the solid light on the ESU) to confirm that the B-Alert USB Receiver and Headset have established a connection. Click on the "Acquisition" button to automatically find the communication port and open the Acquisition Settings dialog box.

A 9-digit number will be assigned to each session. As shown in the Acquisition Settings dialog box, the first four digits are required for the subject number, two digits are provided for the task type, and the other three categories only allow for a single digit to be entered. If any fields or digits are left blank, zeros will be automatically inserted in front of the entered values. The categories are designed to provide flexibility when used in any protocol, especially those with cross over or repeated measure designs.

## C. View Remote Monitor

When Enabled Remote Monitoring is selected in the Settings window on the primary computer, click the "View Remote Monitor" icon on the secondary computer (connected to primary computer via TCP/IP). The View Remote Monitor Settings dialog will be presented. Enter the IP address of the primary computer into the IP Address field within this dialog (see the steps below to determine the IP Address for the primary computer). Once OK is clicked, the Gauges GUI program will open and the signals being acquired will be presented. **Note:** acquisition function must be started on the primary computer *before* the View Remote Monitor function is started on secondary computer. The View Remote Monitor function will not work on the same computer running the 'Acquisition' function.




Tips for finding the IP address for the primary computer:

- Open the Start Menu and select the Run option.
- In the Run window, type “cmd”.
- When the command prompt window opens, type "ipconfig" and click enter.
- The IP Address will be presented.
- Enter this IP Address into the IP Address field on the secondary computer.

## D. Run Tasks

The **Run Tasks** feature allows the technician to run the specified tasks that go along with EEG data acquisition. To begin, ensure that the USB Receiver is plugged into the PC and the headset is switched ON. When the "Run Tasks" button is clicked, the Settings dialog will open. Enter the subject number and visit number, then click OK.

## E. Inspect EEG Record

To begin Offline Playback of a previously recorded file, click the "Inspect EEG Record" icon. This will open a browse window. From the browse window, select the desired .EDF file and click the Open button. The Play EBS Settings dialog will then be presented. Select the playback mode by either checking or un-checking (for off-line playback) the Real-Time Playback check box.

## F. Transfer Files

This feature allows user to upload all pending log files from acquisition to ABM server. Log files will upload one at a time beginning with most recent. Upon successful upload to ABM server, “Pending Log Files:” count will decrement until 0 remain. Upload Status bar is provided to monitor progress of each file.

## G. Acquisition Troubleshooting

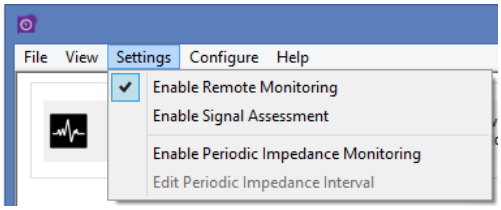
During any of the tasks in the Run Tasks feature, the user may use the following shortcuts:

- Ctrl+Alt+Q (**Quit**): Quit the session. For use by the technician.
- Ctrl+Alt+R (**Restart**): Restart the current task. For use by the technician.
- Ctrl+Alt+P (**Pause**): Pause the current task. It is not recommended to pause the task.
- Ctrl+Alt+C (**Continue**): Resume after Pause.
- Ctrl+Alt+J (**Jump**): Skip the current task.
- Ctrl+Alt+V (**Review**): Review previous instructions before the commencement of the task.

# Chapter 4: Advanced Settings

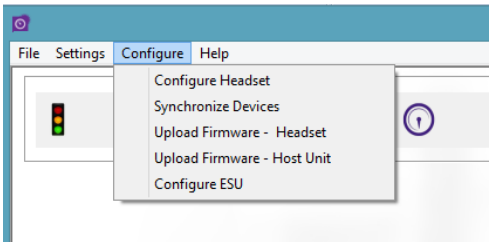
## A. Settings Menu

The Settings menu can be used to 1) Enable Remote Monitoring and 2) Enable Signal Assessment 3) Enable Periodic Impedance Monitoring 4) Edit Periodic Impedance Interval (if (3) is selected)




For remote monitoring, technicians can configure the software to view the live physiological data on the computer running the tasks over TCP/IP. Note: Data on secondary computer will be only visualized (data storage). For signal assessment, all features that show live EEG will display Artifact data. Specific display is determined by strip configuration. For Periodic Impedance Monitoring, impedance checks will be implemented at value set by "Edit Periodic Impedance Interval."

## B. Configure Menu



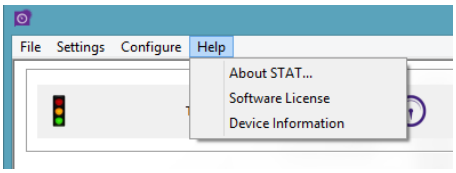

The Configure Menu can be used to 1) Configure Headset, 2) Synchronize Devices, 3) Upload Firmware to the headset, 4) Upload Firmware to host unit, 5) Configure ESU
To Synchronize Devices, ensure that the headset is plugged into the computer, as well as the Bluetooth device. Open the synchronize devices window and click "Search Devices." Look for the headset. The device should have a 12 digit BDA address followed by (ABM EEG XXXXXXXXXX). Click "Connect" then restart the device by unplugging it from the computer, and turning it on wirelessly.

To Upload Firmware, ensure that the headset is plugged into the computer, as well as the Bluetooth device. Locate the appropriate bin file that contains the firmware, then click upload. To restart the device, unplug it from the computer and turn it back on wirelessly.

To Configure ESU, users have the option to switch between wired and wireless data collection modes, as well as to configure the serial and parallel port settings.

## C. Help Menu

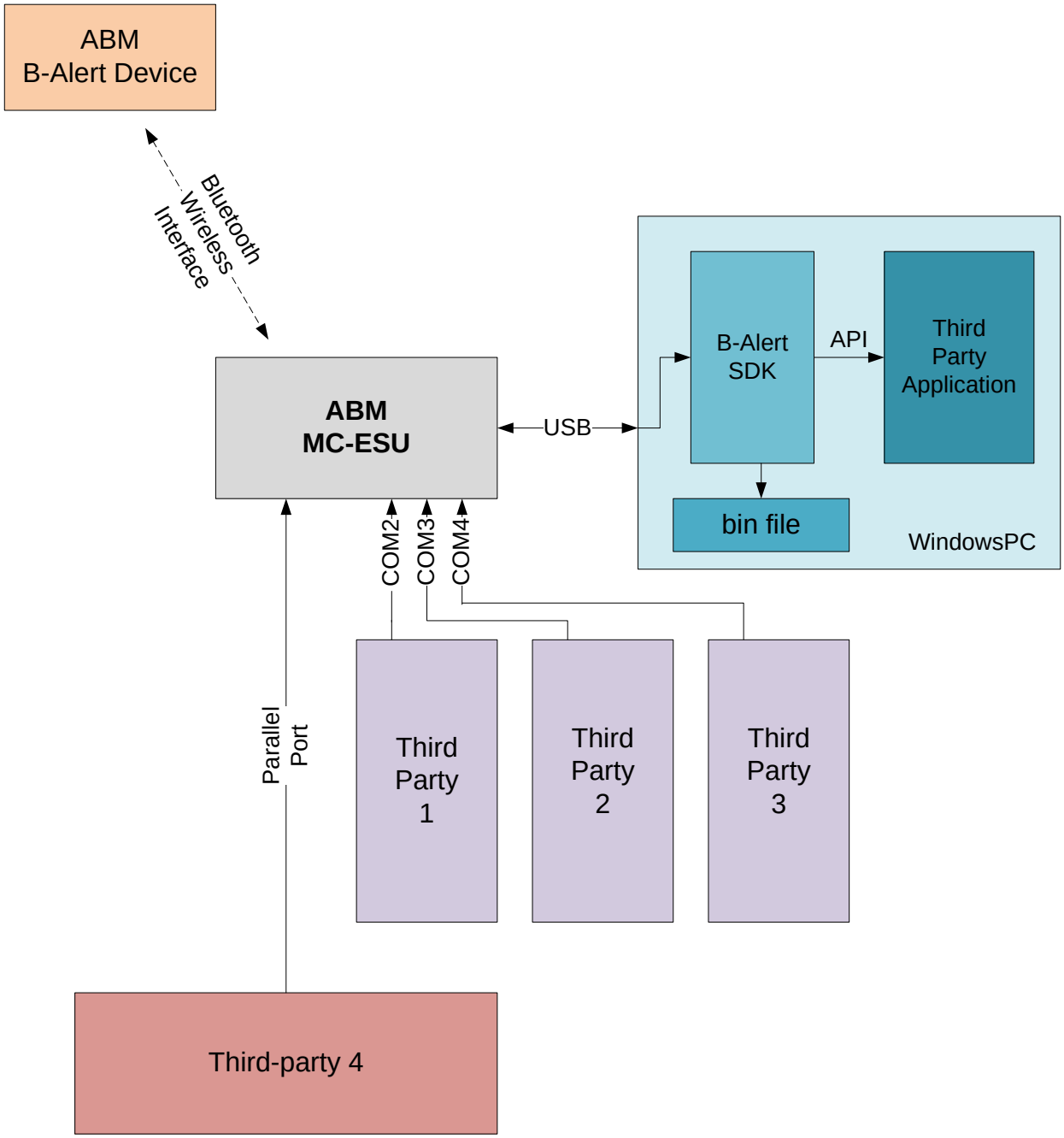
The Help Menu contains the version number of STAT, software license, and device information.



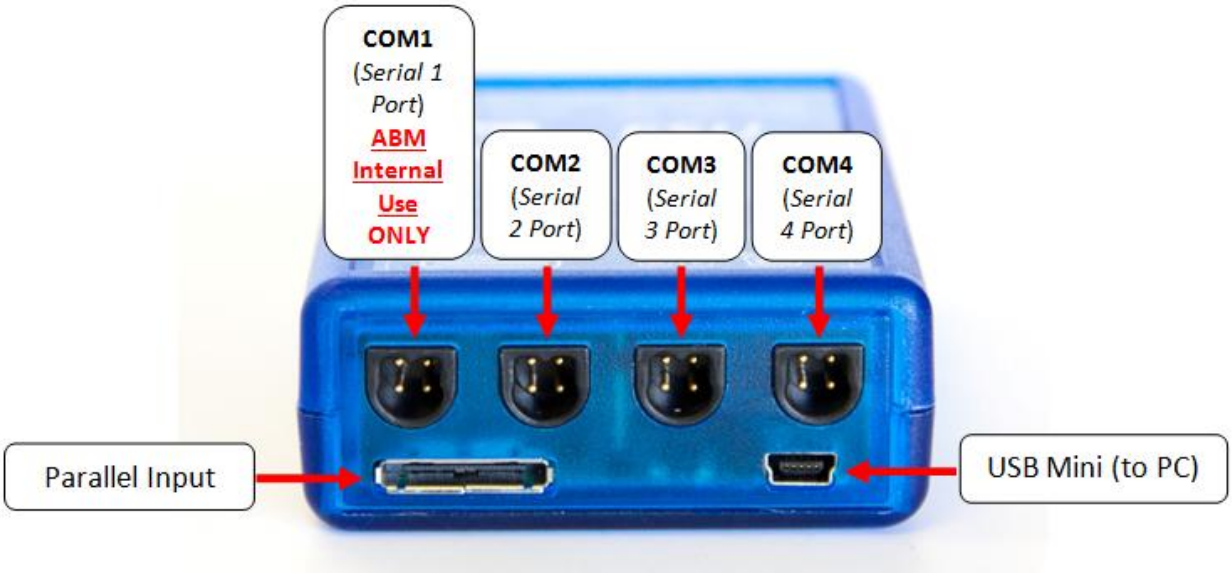

To access device information, the device must be powered ON and the Bluetooth device must be plugged into the computer. Both devices must be synced to each other.

# Chapter 5: External Syncing Unit

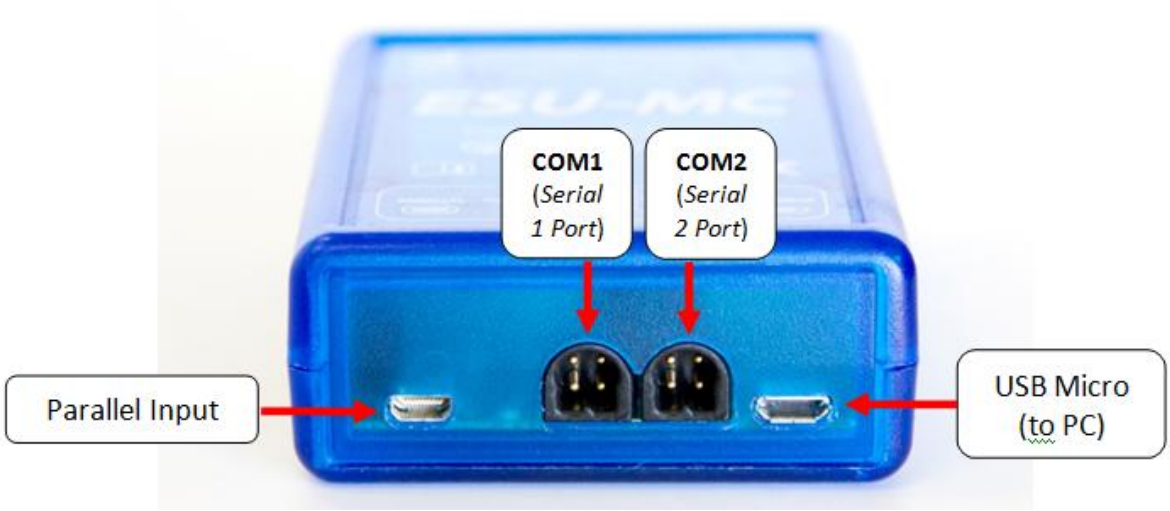
## A. General ESU Information



**ESU hardware (older generation):**




**ESU hardware (current generation):**




The External Syncing Unit (ESU) can be used to timestamp data from both ABM devices and events from third party applications at millisecond level precision through a dedicated robust hardware timer. This addresses the limitations of time stamping using Windows timers, which introduces an average variable latency of ~30-50 msec in most circumstances due to the Windows scheduler. This variable latency can cause havoc in EEG signal analysis, especially in studies that rely on synchronization with external stimuli in order to extract event-related-synchronization/desynchronization as it reduces the Signal-To-Noise-Ratio (SNR) when averaging EEG samples to extract features such as evoked potentials. The ESU thus eliminates Windows-related variable delay by time stamping data packets externally.

The ESU also functions as a Bluetooth receiver for ABM devices, and it has the ability to decode ABM protocol and stream the data to the SDK via the USB port (i.e., the USB port registers a Virtual COM port in the PC). B-Alert X10 bundles two samples from each acquired signal into a single packet that gets time stamped every 8 msec, while the X24 sends only one sample and is time stamped every 4 msec. In the older generation ESU, COM1 is reserved for ABM internal R&D use only, while COM 2, 3, and 4 can be used to acquire third-party events via RS232 serial-port protocol. In the current generation ESU, COM1 and COM2 can be used to acquire third-party events via RS232 serial-port protocol. Applications can also send events via the parallel port, either with or without the STROBE signal. All third party events will be time stamped without delay in the ESU, however, in the event of conflict, EEG packets will have priority over other data. Proprietary cables supplied with the ESU (see Table 1) must be used to send data. All third-party applications must follow ABM protocol (specified in this chapter) while sending data to the ESU. The SDK will unpack the third-party events and store them in a bin file or an Events.EDF file along with ebs/edf data files for offline analysis. The third party events can also be acquired in real-time using SDK APIs.